

The NASA New Millennium Program: Space Flight Validation of Advanced  
Technologies for Future Science Missions.

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A broad range of advanced technologies are needed to support NASA's ambitious plans for planetary exploration during the next decade. To address these needs, the NASA New Millennium Program (NMP) identifies breakthrough spacecraft and instrument technologies and validates them in space to reduce their cost and risk. The first NMP Deep Space mission, DS1, was launched on October 24, 1998. Since then, it has successfully validated a solar-powered ion propulsion system, a miniaturized deep space transponder, autonomous operations and navigation software, multifunctional structures, low-power microelectronics and 2 instruments: the Miniature Integrated Camera and Spectrometer (MICAS), and the Plasma Experiment for Planetary Exploration (PEPE). To validate these technologies in a realistic environment, DS1's trajectory includes a close (<10km) flyby of asteroid 1992KD. An extended mission will allow encounters with comets Wilson-Harrington and Borrelly.

The second NMP mission, DS2, consists of a pair of micro penetrators that are targeted near the Martian South Pole (71 to 76 S). DS2 was launched on January 3, 1999 as a piggyback payload on the Mars Surveyor '98 Lander cruise stage. After crashing into the Martian surface at greater than 200 m/s on December 3, 1999, these probes will validate technologies that will enable future Mars penetrator networks. These technologies include a single-stage, passive atmospheric entry system and a high-impact landing system designed to deliver a payload up to 1 meter below the Martian surface. This mission will also validate a miniaturized telecom system, low-temperature batteries, a suite of miniaturized in-situ scientific instruments, and other innovative packaging technologies.

The next 2 NMP space science missions are currently being planned. If approved, Space Technology 3 (ST3) will validate technologies for separated spacecraft optical interferometry, to enable the ambitious Terrestrial Planet Finder (TPF) mission. The ST5 mission will validate advanced technologies needed by the space physics and astrophysics communities.